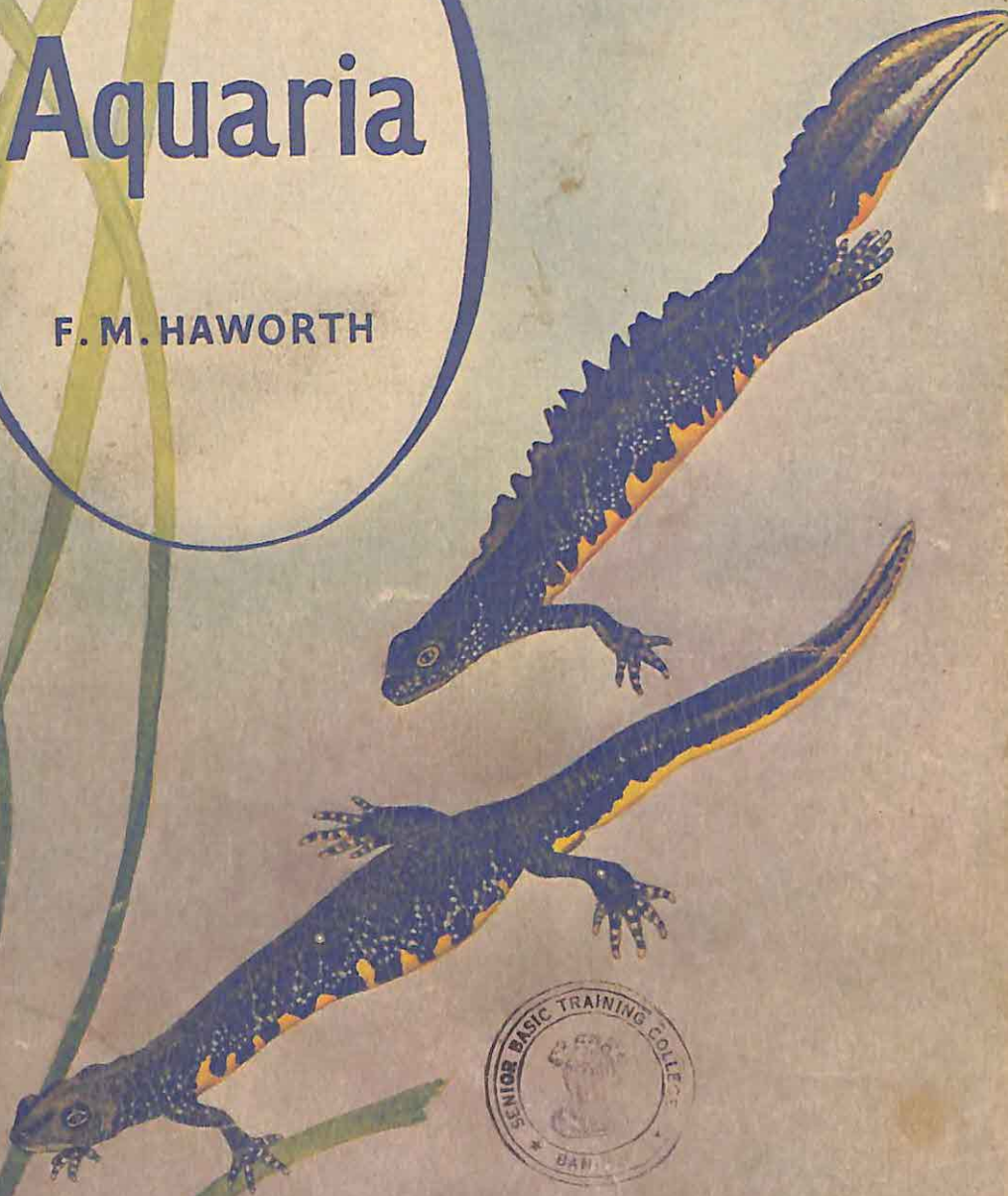


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Aquaria

F. M. HAWORTH



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NATURAL HISTORY SERIES

Number One

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AQUARIA

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AN AQUARIUM IN SUMMER

POND PLANTS:—

1 Starwort

2 Canadian Pondweed

3 Arrowhead

4 Curly Pondweed

ANIMALS:—

5 Caddis Larvæ

6 Fresh-water Winkle

7 Pond Mussel

8 Dragon-fly Larva

9 Toad Tadpole

AQUARIA



An aquarium is a tank in which water-plants and animals live. It is usually made of glass so that we can watch the interesting things that happen there.

An aquarium is rather like a tiny pond, and it is not difficult to set one up for yourself. When we speak of plants and animals that live in water, we call them aquatic plants and animals. This book will tell you how to set up an aquarium, and how to look after it when you have done so.

On page 5 you can see all the different things you will need. Let us make a list of these.

1. A glass tank or large bowl.
2. Aquarium sand or gravel.
3. Several large stones.
4. Aquatic plants and animals.
5. A cover for the aquarium.
6. A few strips of lead or small stones.
7. A piece of oilcloth.
8. A large jug.
9. A bucket or large basin.
10. Several large jam-jars.
11. A small net which you can make yourself.
12. Green paper to cover the back and sides.

Glass tanks can be bought in pet-shops or large stores. They are made in different sizes; the one in the picture was 2 feet \times 1 foot \times 1 foot. Some aquaria have metal corners painted green, and make

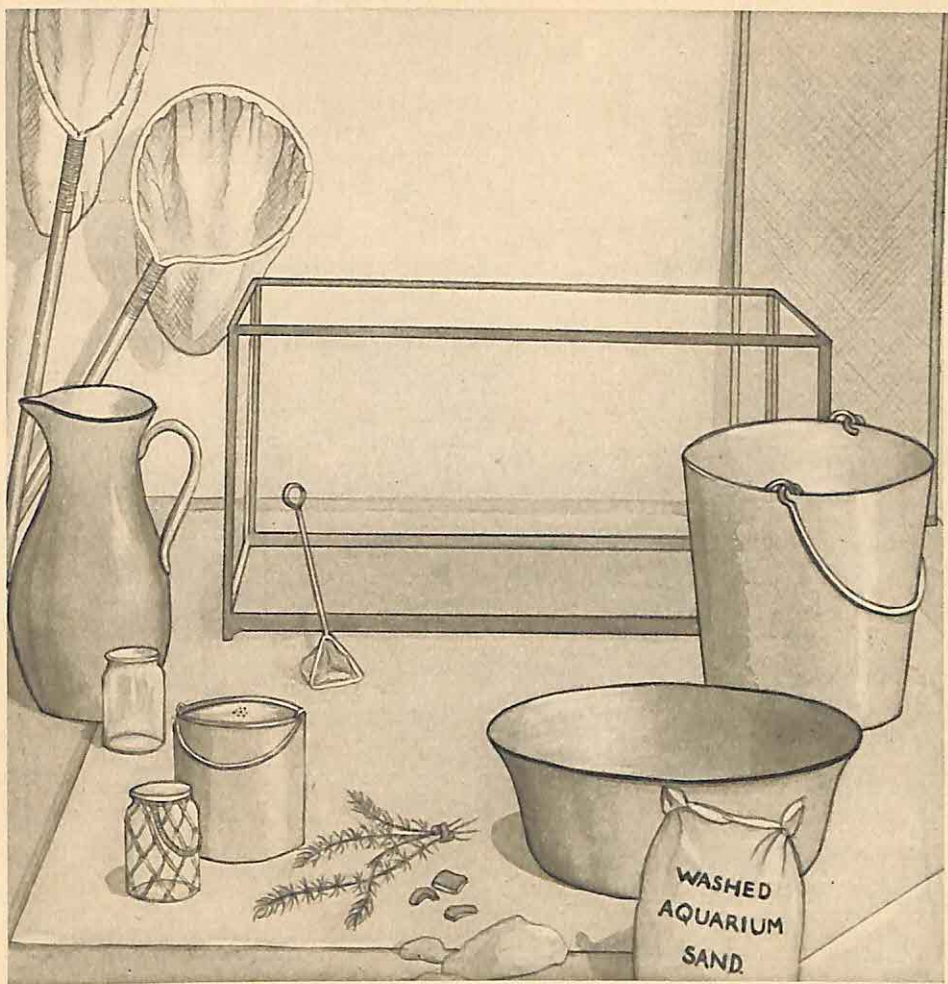


beautiful homes for pond-creatures; but it is not essential to have an aquarium of this type. A large earthenware bowl like the one shown above will make a very good home.

SETTING UP THE AQUARIUM

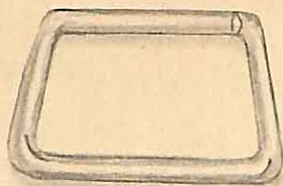
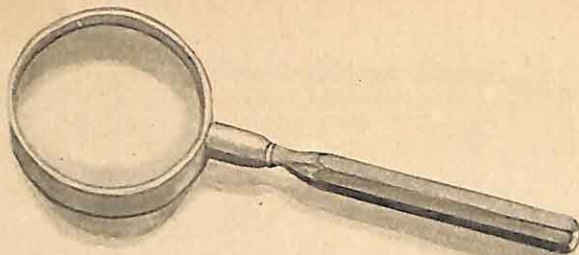
When you have collected all the things you will need, decide where the aquarium is to stand. All green plants need light if they are to keep healthy; direct sunlight, however, will cause the water to get warm, and the microscopic plants will then grow quickly and cover the glass with a green slime. A table near a north window is a good position. Choose the height of the table carefully, so that you can look into the aquarium comfortably both from above and from the side. Cover the table with the piece of oilcloth.

Wash thoroughly both the aquarium and the sand. Put the sand into a large bowl, and let water run on to it from a tap, stirring all the time. Keep on washing until the water that runs away is absolutely clear. This may take quite a long time. Place the washed sand in the aquarium, wash the stones, and arrange these so that there are several hiding-places for the animals.



You are now ready to add the water. Some people say that you should use pond-water, as it contains thousands of tiny animals and plants that form the food of larger animals. Pond-water is often rather muddy and you may not get your tank really clear if you use it. It is better to use tap-water, and to collect and add the tiny water-creatures later, when your tank is finished.

Never pour water directly on to the sand or it may remain cloudy. Put a large plate over the sand and pour the water carefully



on to this. You could use a piece of white paper instead of the plate. Remove the paper or plate when the tank is full. Mark the surface-level of water by fixing a thin strip of sticky paper on the glass, and then keep the water at this level by adding more as it evaporates. When you have filled the tank, do not put your hands in the water more than is absolutely necessary, otherwise grease from your skin will form a thin film on the surface. This will make it difficult for some of the animals to breathe.

The cover of the aquarium can be either a large piece of glass or a piece of perforated zinc which can be bought at an ironmonger's. If you choose glass, you must place a piece of plasticine at each of the four top corners of the tank so that the glass rests on these. Air can then pass freely over the surface of the water.

Five useful things to have are:

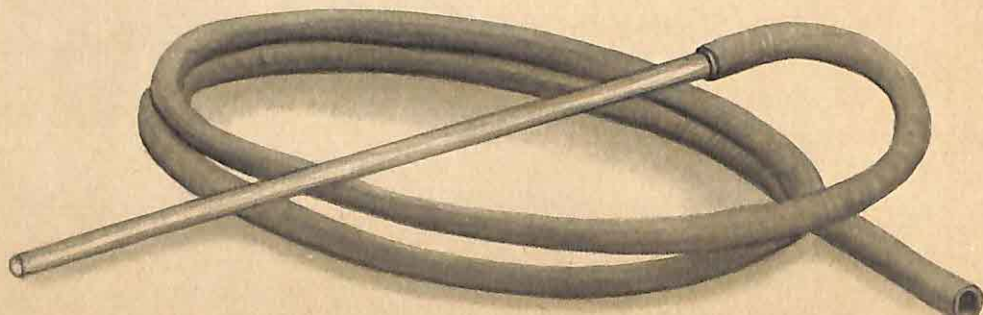
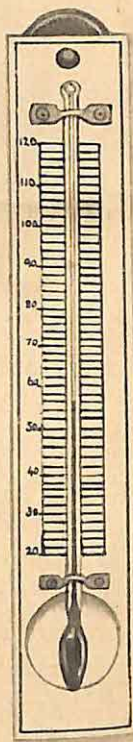
A syphon to empty the aquarium.

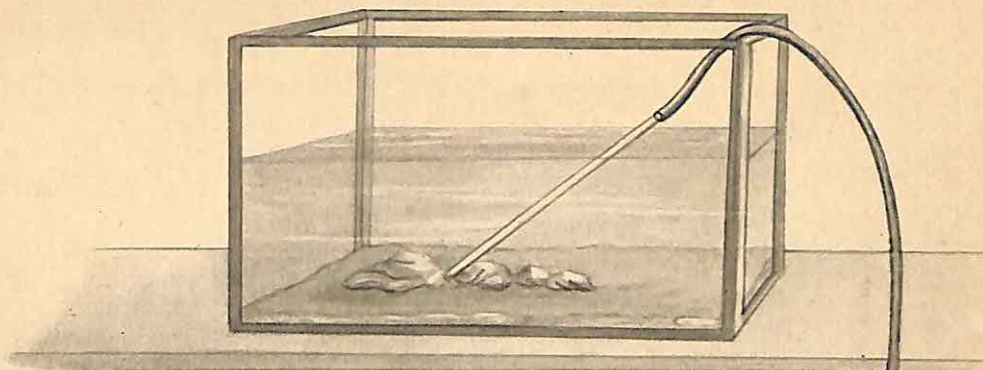
Wooden forceps.

A magnifying-glass.

A floating square of glass tubing.

A floating thermometer.





If you have set up your aquarium properly, and if the animals and plants are healthy, you should not need to change the water. But if at any time you need to do so, use the syphon made from glass and rubber tubing. Put the syphon completely under water in the aquarium until all the air-bubbles have come out. Pinch the end of the rubber tube hard, lift it carefully out of the aquarium and put it in a bucket on the floor. Be careful that the glass end stays under water. Remove your hand from the end of the tube and water will begin to flow from the tank into the bucket.

An aquarium can also be filled using the syphon and bucket of water. This time, however, the bucket must be placed on a chair or shelf ABOVE the aquarium instead of below it.

If you intend to collect your own plants and animals from a pond, there are several useful things that can easily be made:

1. A collecting tin, or vasculum.
2. Large and small ponding-nets.
3. A string carrier for a jam-jar.



HOW TO MAKE A LARGE PONDING-NET

Materials required:

- A broom handle.
- Galvanised wire (3 feet 2 inches).
- Fine net (square of side 22 inches).
- Adhesive tape 1 inch wide.
- Linen tape (3 feet 4 inches).
- Twine for binding.
- Varnish.

Bend the wire into a ring of $10\frac{1}{2}$ -inch diameter with two 3-inch shanks as in Fig. 2. From the square of net, cut a circle of radius 11 inches. Turn a hem sufficiently wide to slip easily over the wire, leaving the shanks free. Bind this net with the linen tape, leaving sufficient free to pull down the sides of the shanks. Make a groove at each side of the handle 3 inches long, and deep enough to hold the wire (Fig. 1). Fix the wire firmly with the adhesive tape (Fig. 3). Glue the linen tape over the adhesive tape and complete by binding evenly with twine, and varnishing (Fig. 4).



Fig. 1

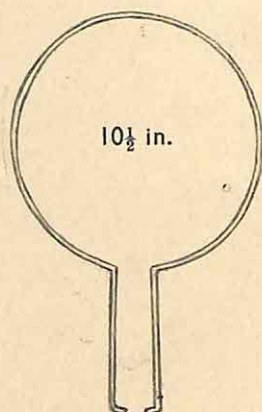


Fig. 2

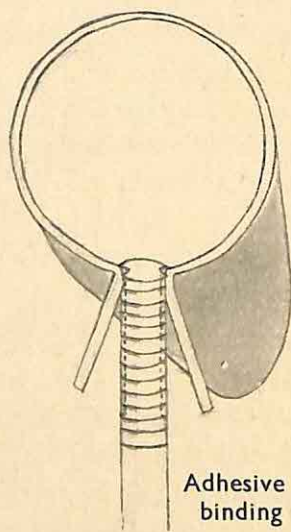


Fig. 3

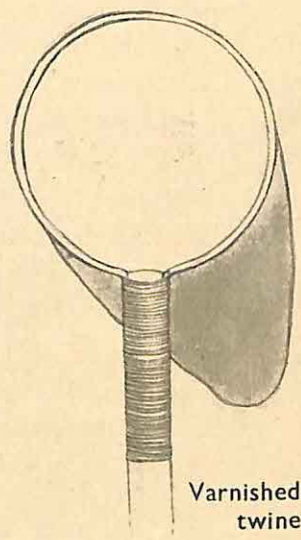


Fig. 4

A PONDING-JAR

A useful carrier for a 2-lb. jam-jar can be made with string.

Cut sixteen pieces of string 36 inches long and fold each in half. Attach each folded piece to a curtain ring as in Fig. 5. Continue in this way until there is no space left on the ring. Then knot together neighbouring pieces of string (Fig. 6) until your carrier is big enough to cover the jam-jar up to the neck. Knot for the last time. Thread a piece of elastic through these loops and add a handle. (Fig. 7.)

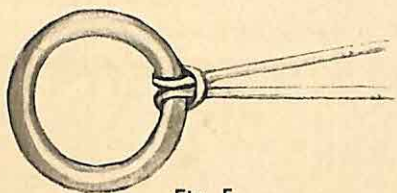


Fig. 5

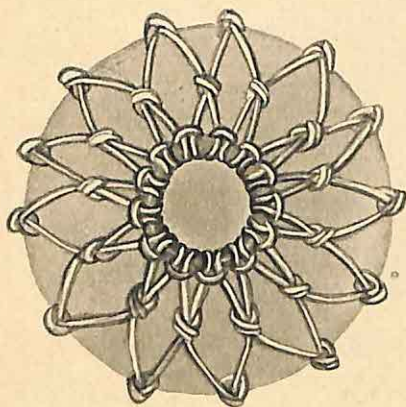


Fig. 6

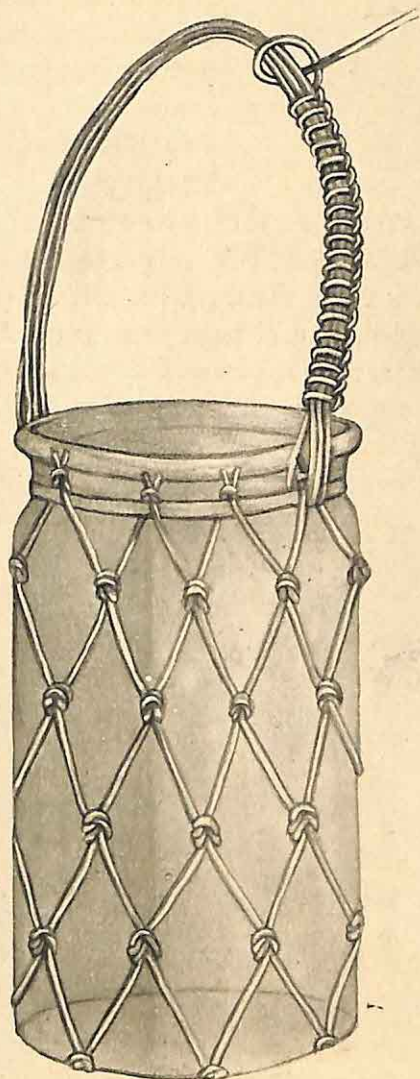


Fig. 7

A detailed botanical illustration. On the left, a 'Water crowfoot' plant is shown with a thick, dark, vertical stem that branches out into a dense, feathery root system at the bottom. Several stems rise from the crown of the plant, bearing flowers of different stages: some are fully open with five petals, while others are buds. The leaves are large and deeply lobed. To the right, a 'Lesser duckweed' is depicted as a long, thin, horizontal stem with small, rounded, leaf-like structures along its length. Numerous fine, hair-like roots hang down from the underside of this stem.

Water crowfoot

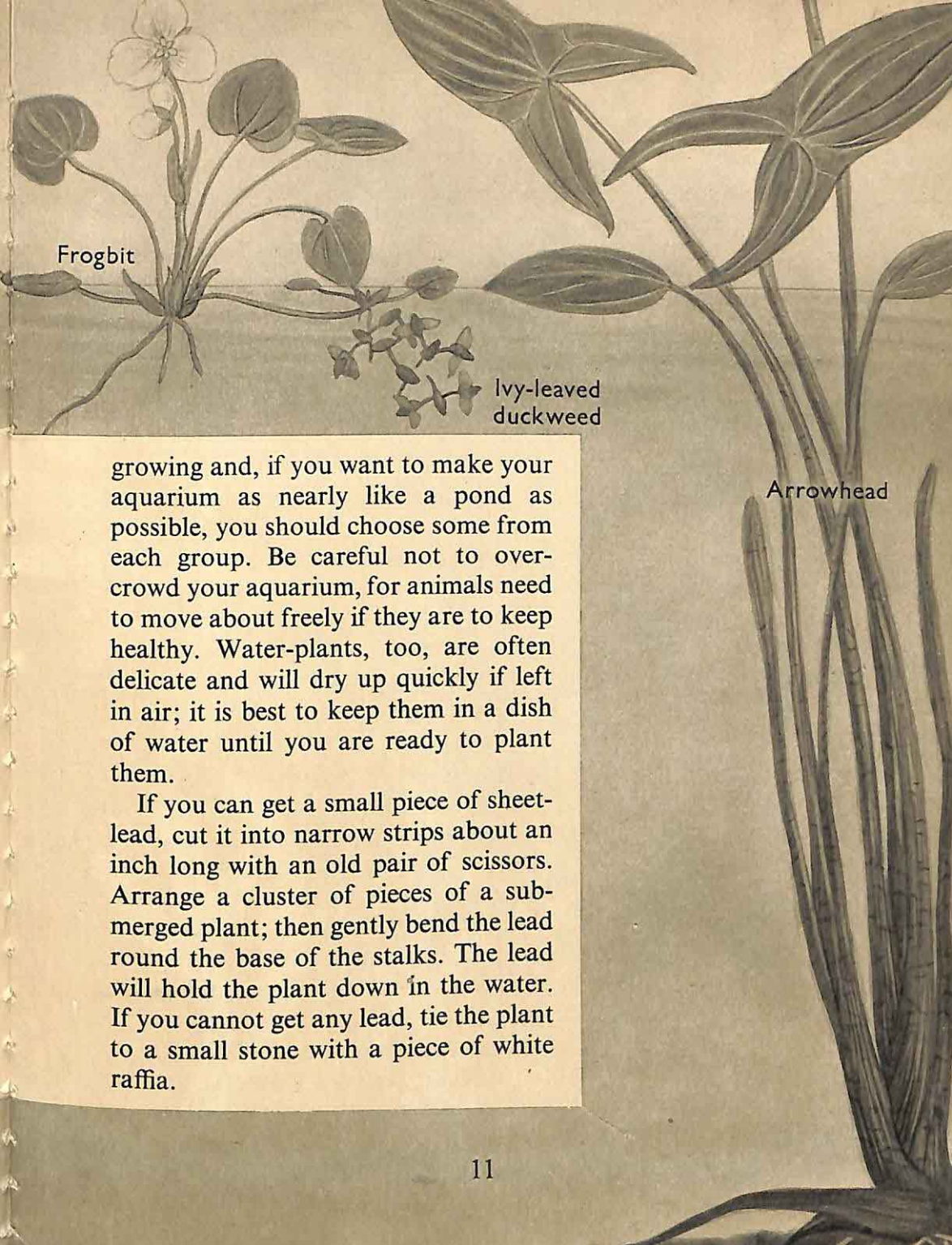
Lesser duckweed

PLANTS FOR THE AQUARIUM

It is time now to decide which plants to have. If there is a pond near you, visit it and see what you can collect for yourself. It is not necessary to get the whole plant, as pieces broken off will usually grow. If you cannot do this, you will have to buy your plants.

Look carefully at all the pictures. Then make a list of the names of the plants shown. You will notice how some float at the surface of the water, while others are completely below, or submerged, as it is called. Others are part above water and part below. On your list put an "F" beside the names of those that float, an "S" beside those that are completely submerged, and a "B" (for both) beside those that have leaves both above and below water.

In ponds you may find all three kinds

The illustration shows three types of aquatic plants. On the left is a Frogbit with heart-shaped leaves and a single flower. In the center is a cluster of Ivy-leaved duckweed with small, rounded leaves. On the right is an Arrowhead plant with large, arrow-shaped leaves and long, thin stems. The labels are placed near their respective plants.

Frogbit

Ivy-leaved
duckweed

Arrowhead

growing and, if you want to make your aquarium as nearly like a pond as possible, you should choose some from each group. Be careful not to overcrowd your aquarium, for animals need to move about freely if they are to keep healthy. Water-plants, too, are often delicate and will dry up quickly if left in air; it is best to keep them in a dish of water until you are ready to plant them.

If you can get a small piece of sheet-lead, cut it into narrow strips about an inch long with an old pair of scissors. Arrange a cluster of pieces of a submerged plant; then gently bend the lead round the base of the stalks. The lead will hold the plant down in the water. If you cannot get any lead, tie the plant to a small stone with a piece of white raffia.

PLANTS FOR T



Starwort

Canadian pondweed

Coarse Canadian pondweed

Willow moss

THE AQUARIUM

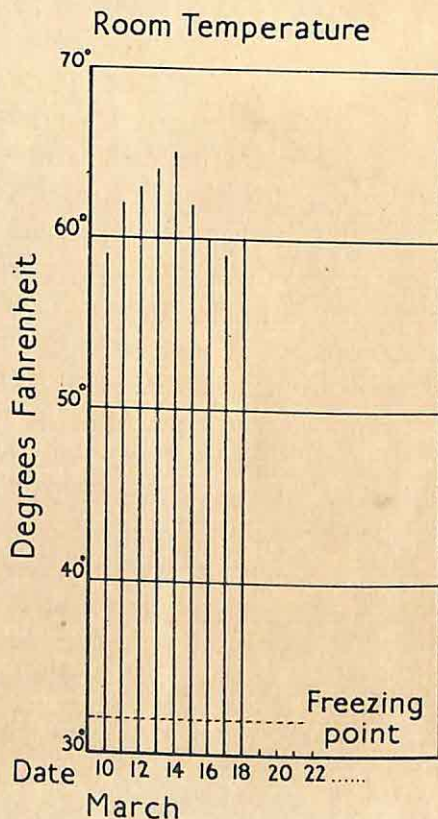
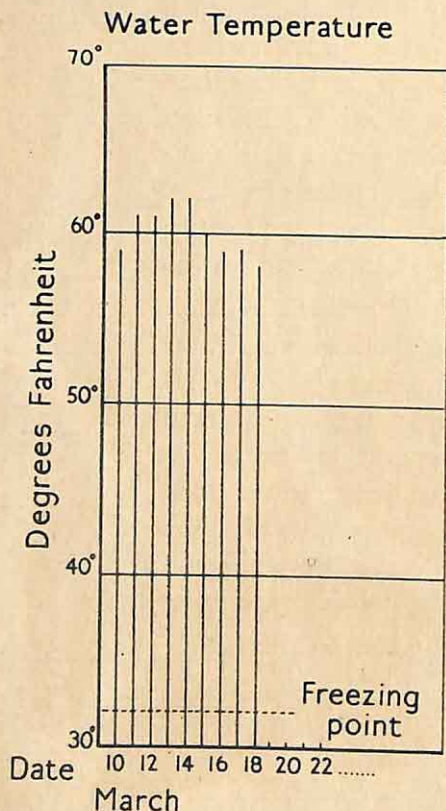


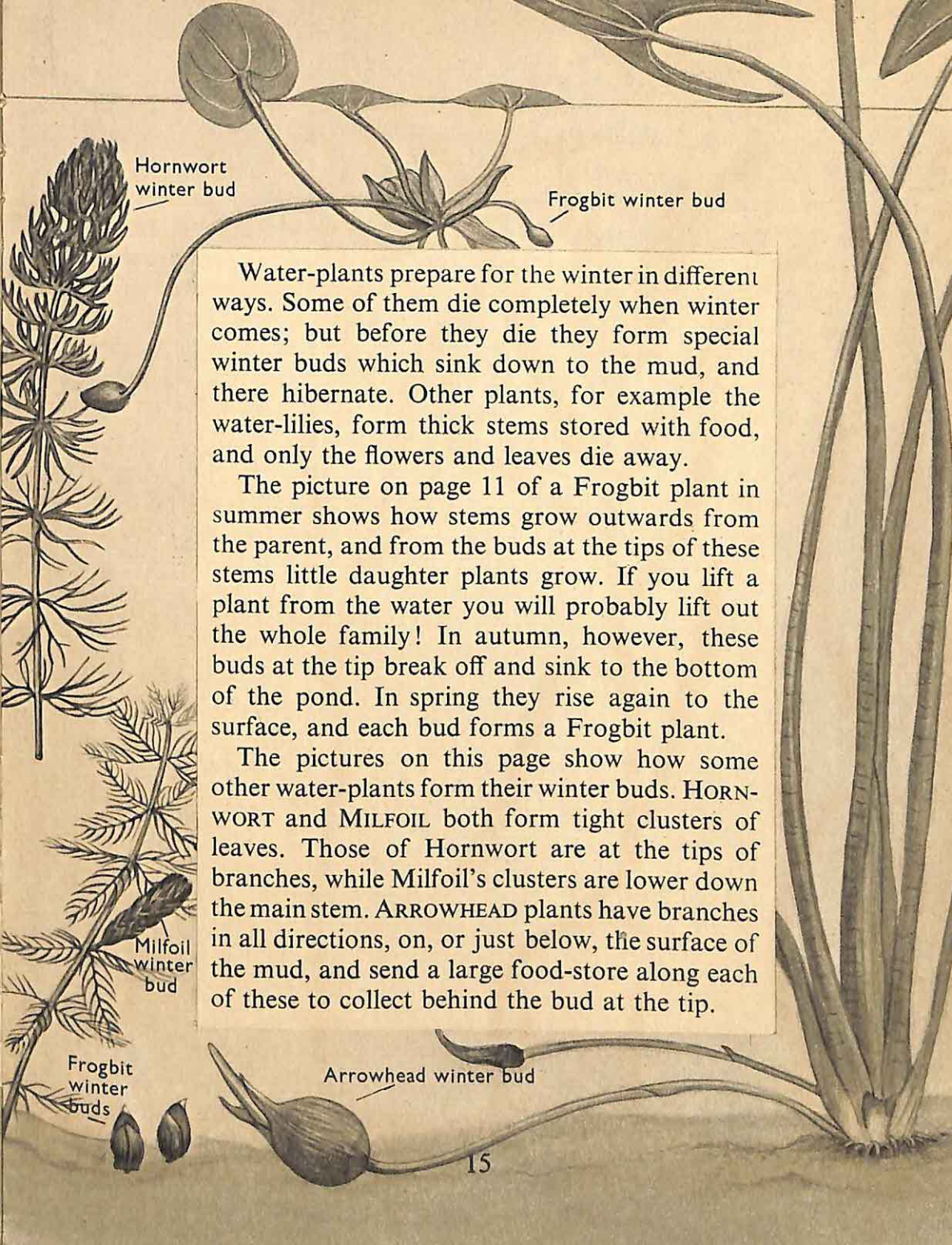
Water milfoil

Curly pondweed

Vallisneria

When all is arranged, fix a piece of green paper at the back and sides of the aquarium. The green background will make it easier to see the animals and will also shade them from strong light. Place your thermometer in the water and take the temperature. Remember it is very important that the water should be cool. Make a chart on which you can enter the temperature each day at the same time (say 9 o'clock). It is interesting to take the air temperature in the room at the same time. Keep a record of both, so that you can compare them. The charts below show the air and water temperatures taken at 9 a.m. each morning for a week in March. What is interesting about them? Do your charts show the same thing? Look at records for other weeks and discover what usually happens.





Water-plants prepare for the winter in different ways. Some of them die completely when winter comes; but before they die they form special winter buds which sink down to the mud, and there hibernate. Other plants, for example the water-lilies, form thick stems stored with food, and only the flowers and leaves die away.

The picture on page 11 of a Frogbit plant in summer shows how stems grow outwards from the parent, and from the buds at the tips of these stems little daughter plants grow. If you lift a plant from the water you will probably lift out the whole family! In autumn, however, these buds at the tip break off and sink to the bottom of the pond. In spring they rise again to the surface, and each bud forms a Frogbit plant.

The pictures on this page show how some other water-plants form their winter buds. HORNWORT and MILFOIL both form tight clusters of leaves. Those of Hornwort are at the tips of branches, while Milfoil's clusters are lower down the main stem. ARROWHEAD plants have branches in all directions, on, or just below, the surface of the mud, and send a large food-store along each of these to collect behind the bud at the tip.



ANIMALS FOR THE AQUARIUM

Animals in an aquarium are always interesting to watch, and when you have learnt a few important things about aquarium-keeping you will be able to watch whole life-histories. Try to find out all you can about each animal you keep, especially how it moves, how it feeds, how it breathes, and how it grows.

This book suggests only a few animals that will thrive in an aquarium, and the important things you need to know in order to keep them healthy.

FRESH-WATER SNAILS AND MUSSELS

It is always a good plan to have pond-snails in an aquarium, for they help to keep the glass clean. They feed on plants and are therefore called **VEGETARIANS**. The pictures on these pages will help you to recognise six common pond-snails that are easy to keep.

Giant pond-snail

Fresh-water winkle

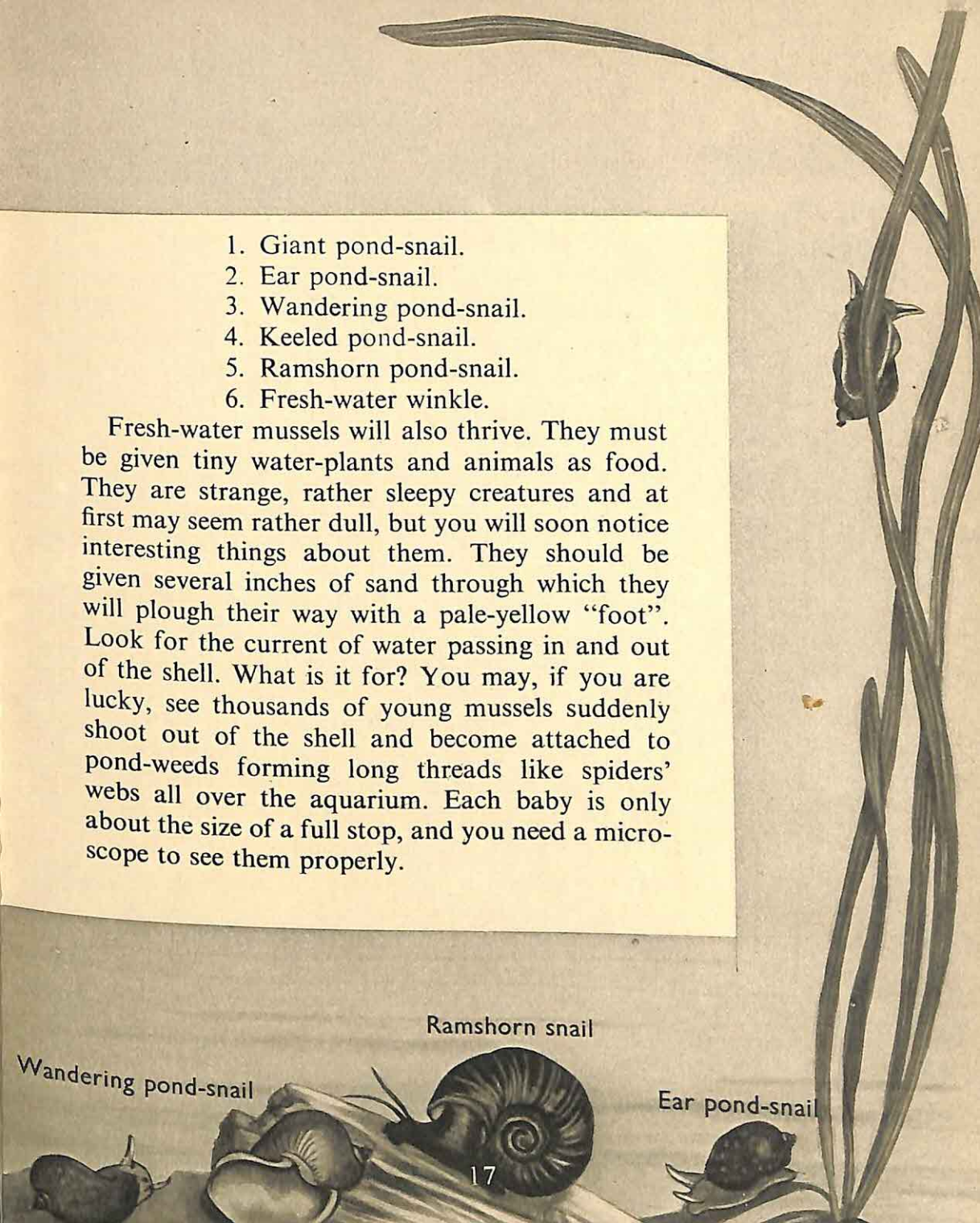
1. Giant pond-snail.
2. Ear pond-snail.
3. Wandering pond-snail.
4. Keeled pond-snail.
5. Ramshorn pond-snail.
6. Fresh-water winkle.


Fresh-water mussels will also thrive. They must be given tiny water-plants and animals as food. They are strange, rather sleepy creatures and at first may seem rather dull, but you will soon notice interesting things about them. They should be given several inches of sand through which they will plough their way with a pale-yellow "foot". Look for the current of water passing in and out of the shell. What is it for? You may, if you are lucky, see thousands of young mussels suddenly shoot out of the shell and become attached to pond-weeds forming long threads like spiders' webs all over the aquarium. Each baby is only about the size of a full stop, and you need a microscope to see them properly.

Ramshorn snail

Ear pond-snail

Wandering pond-snail



A detailed illustration of a dragon-fly larva clinging to a thin, vertical plant stem. The larva has a segmented, cylindrical body with dark spots, long legs, and a pair of antennae. Above the larva, a large, broad leaf with prominent veins is shown. The background is a plain, light-colored surface.

Dragon-fly
larva

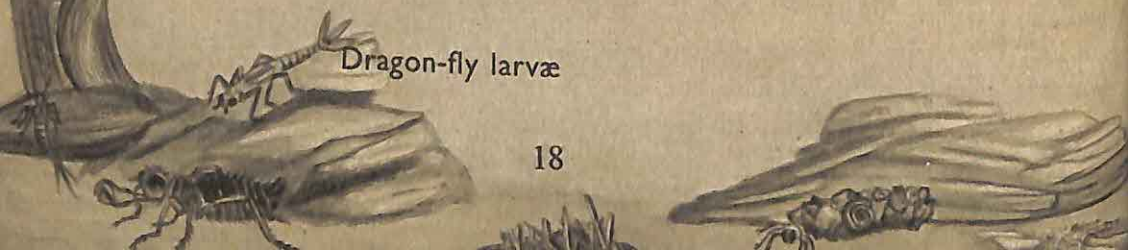
AQUATIC INSECTS

A number of insects spend the early part of their lives as water-dwellers, and a few spend their whole lives there. An egg of a water-insect hatches into a tiny creature quite unlike its parents in appearance and it has been given the name of LARVA. Several insect larvæ will live well in an aquarium. Very few of them are vegetarians like the snails, but the Caddis larva is one of these. Most of the other insect larvæ spend their whole time searching for animals smaller than themselves to eat. They are called CARNIVORES.

When choosing animals for your aquarium, it is important to know which of them are carnivores.

CADDIS LARVÆ are easy to keep. You can watch them build their houses of sticks and stones.

DRAGON-FLY LARVÆ of different kinds are in-

An illustration showing two dragon-fly larvae on a rocky surface. One larva is positioned higher on a rock, while the other is lower, near some small tufts of grass. The rocks are depicted with shading to show their texture.

Dragon-fly larvæ

teresting too, but they ARE the dragons of the pond and will attack and kill any creatures weaker than themselves. They should be kept alone or with animals like snails or caddis, which have a house into which they can escape.

The natural food of these larvæ is tadpoles, but they will eat raw meat if there is nothing else. When fully grown, they rest for several days, and then leave the water to become beautiful dragon-flies. This change is one of the most wonderful things to watch, and you should try to see it for yourselves.

If there is no plant in the aquarium with stems and leaves above water, you should put a stick with a rough surface in the tank. It should stand about two feet above the surface so that the larva can climb up this when it is fully grown. Then open a window near the tank, so that when its wings are dry and strong, the dragon-fly, which has come out of the larval skin, can fly off into the sunshine.



Lesser water-boatman



Carnivorous water-beetle



717


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LARGE WATER-BOATMEN and CARNIVOROUS BEETLES are wonderful swimmers and divers. They are very fierce and will kill any other living animal in the aquarium, and for this reason they should be kept alone. They should be fed daily on raw meat. Tie a piece of string round a small piece of meat, and hang this in the aquarium for about an hour each day; remove what is left. As they fly by night, it is important to keep a cover over the aquarium.

The lesser water-boatman is a vegetarian and will live peacefully with other animals.

WATER-SPIDERS should be kept alone and fed on tiny water-life. They may build one of their beautiful nests in the water. Give them plenty of room to move about.

ADULT NEWTS should thrive during March, April, and May. The female will lay her eggs on the leaves of water-plants. The larvæ which hatch from the eggs should be removed very carefully on a piece of plant and put into a "Nursery" tank, otherwise the adults may eat them if they get hungry.



Water-spider

If you keep newts, watch the female lay her eggs, and notice how the egg changes shape each day, until it hatches into a beautiful tiny tadpole, with dark copper-coloured eyes and three feathery gills at each side of the head. How different it looks from its relations, the frog and toad tadpoles! These larvæ can now be fed on tiny water-creatures.

The adults will feed on small shreds of lean raw meat if you hold a shred in a pair of forceps and move it gently in front of the newt's mouth. They also need a piece of floating cork on which to climb. If they come out of the water frequently and sit on this, you will know that it is time to take them back to a pond so that they can climb out on to land. Adult newts leave the water during the summer months.

On the cover of this book is a painting of a pair of Great-crested newts, or Tritons.

When planning which animals to have in your aquarium, look at the list on p. 22 and see whether they will live peacefully together. Carnivores should be put only with creatures that have some means of escape.

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♀

Common newts
Male and Female

CARNIVORES

Dragon-fly larvæ	}	feed on meat or small tadpoles.
Large water-boatmen		
Carnivorous water-beetles		
Tadpoles with legs		
Newts	}	feed on tiny water-creatures.
Pond-mussels		
Water-spiders		
Newt-tadpoles		
Water-scorpion		
Fish—feed on tiny water-creatures and special fish food.		

VEGETARIANS

(These feed on the plants in the water.)

Caddis larvæ.
Water-snails.
Silver water-beetles.
Tadpoles, when young.
Water-louse.
Lesser water-boatman.

THESE ANIMALS WOULD LIVE WELL TOGETHER

1. Dragon-fly larvæ, snails, and caddis.
2. Newts, snails, and caddis.
3. Carnivorous water-beetles and snails.
4. Goldfish, snails, and caddis.
5. Water-spiders and snails.
6. Silver water-beetles, tadpoles, and snails.
7. Choose this one for yourself.





AN AQUARIUM IN AUTUMN

Can you name (a) five animals;
(b) three pond plants;
(c) four winter buds?

THINGS TO REMEMBER IN AQUARIUM-KEEPING

1. Wash everything thoroughly.
2. Choose the position for your aquarium carefully. It should never be in direct sunlight.
3. Choose your plants carefully, and do not overcrowd.
4. Remember that some animals are carnivores, and choose those that will live together peacefully.
5. Feed animals regularly, but do not leave any uneaten meat in the aquarium.
6. Look every day at your aquarium and watch what the animals do. Start your diary.

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OTHER BOOKS IN THIS SERIES

2. POND DWELLERS

Gives information about animals and plants which are to be found in ponds.

3. WASPS

Describes in detail the study of wasps and a wasps' nest.

ALL FULLY ILLUSTRATED

